

(Revision on Probability Distributions)

1. In a certain city district the need for money to buy drugs is stated as the reason for 75% of all thefts. Find the probability that among the next 5 theft cases reported in this district,
 - a) exactly 2 resulted from the need for money to buy drugs;
 - b) at most 3 resulted from the need for money to buy drugs.

2. According to Chemical Engineering / Progress (Nov. 1990), approximately 30% of all pipework failures in chemical plants are caused by operator error.
 - a) What is the probability that out of the next 20 pipework failures at least 10 are due to operator error?
 - b) What is the probability that no more than 4 out of 20 such failures are due to operator error?
 - c) Suppose, for a particular plant, that, out of the random sample of 20 such failures, exactly 5 are operational errors. Do you feel that the 30% figure stated above applies to this plant? Comment.

3. In testing a certain kind of truck tire over a rugged terrain, it is found that 25% of the trucks fail to complete the test run without a blowout. Of the next 15 trucks tested, find the probability that
 - a) from 3 to 6 have blowouts
 - b) fewer than 4 have blowouts
 - c) more than 5 have blowouts.

4. It is known that 60% of mice inoculated with a serum are protected from a certain disease. If 5 mice are inoculated, find the probability that
 - a) none contracts the disease;
 - b) fewer than 2 contract the disease;
 - c) more than 3 contract the disease.

5. Suppose that airplane engines operate independently and fail with probability equal to 0.4. Assuming that a plane makes a safe flight if at least one-half of its engines run, determine whether a 4-engine plane or a 2 engine plane has the higher probability- for a successful flight.

6. If the probability that a fluorescent light has a useful life of at least 800 hours is 0.9, find the probabilities that among 20 such lights
 - a) exactly 18 will have a useful life of at least 800 hours;
 - b) at least 15 will have a useful life of at least 800 hours;
 - c) at least 2 will not have a useful life of at least 800 hours.

7. A secretary makes 2 errors per page, on average. What is the probability that on the next page he or she will make
 - a) 4 or more errors?
 - b) no errors?

8. A certain area of the eastern United States is, on average, hit by 6 hurricanes a year. Find the probability that for a given year that area will be hit by
 - a) fewer than 4 hurricanes;

b) anywhere from 6 to 8 hurricanes.

9. Wages for workers in a particular industry have an average of \$11.90 per hour with a standard deviation of 40 cents (1\$ = 100 cents). The wages are considered to be normally distributed.
 - a. Suppose you are employed in this industry. What would your wage have to be if 75% of all workers earn more than you?
 - b. What fraction of workers make between \$12 and \$13 per hour?

10. The reaction time to a certain psychological experiment is considered to be normally distributed with a mean of 20 seconds and a standard deviation of 4 seconds.
 - a. What fraction of subjects take between 15 and 30 seconds to react?
 - b. What fraction of subjects take longer than 30 seconds to react?
 - c. What is the reaction time such that only 10% of subjects are faster?

11. The loaves of rye bread distributed to local stores by a certain bakery have an average length of 30 centimeters and a standard deviation of 2 centimeters. Assuming that the lengths are normally distributed, what percentage of the loaves are
 - a. longer than 31.7 centimeters?
 - b. between 29.3 and 33.5 centimeters in length?
 - c. shorter than 25.5 centimeters?

12. A research scientist reports that mice will live an average of 40 months when their diets are sharply restricted and then enriched with vitamins and proteins. Assuming that the lifetimes of such mice are normally distributed with a standard deviation of 6.3 months, find the probability that a given mouse will live
 - a. more than 32 months;
 - b. less than 28 months;
 - c. between 37 and 49 months.

13. The finished inside diameter of a piston ring is normally distributed with a mean of 10 centimeters and a standard deviation of 0.03 centimeter.
 - a. What proportion of rings will have inside diameters exceeding 10.075 centimeters?
 - b. What is the probability that a piston ring will have an inside diameter between 9.97 and 10.03 centimeters?
 - c. Below what value of inside diameter will 15% of the piston rings fall?